Bone marrow-derived mesenchymal stem cells in fibrin augment angiogenesis in the chronically infarcted myocardium.

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Public Summary:

Scientific Abstract:
AIMS: Current efforts to treat myocardial infarction include the delivery of cells and matrix scaffolds. Bone marrow-derived mesenchymal stem cells (BM-MSCs) are multipotent stem cells that secrete angiogenic growth factors, and fibrin has been shown to be a biomaterial that provides structural support to cells and tissues. The objective of this study was to characterize the attachment and viability of BM-MSCs in fibrin in vitro, and then to assess the efficacy of treatment with BM-MSCs in fibrin for promoting neovascularization in the chronically infarcted myocardium. MATERIALS & METHODS: BM-MSCs were cultured in fibrin and assessed for cell attachment and viability by using immunofluorescence staining for actin filaments and Live/Dead((R)) viability assays, respectively. To determine the efficacy of BM-MSCs in fibrin in vivo, chronically infarcted rat hearts were treated with either cells, cells in fibrin, fibrin or saline (n = 9). After 5 weeks, the infarct scar tissues were assessed for neovascularization. RESULTS: BM-MSCs exhibited robust cell attachment and viability when cultured in fibrin in vitro. Furthermore, when injected together into the infarcted tissue, BM-MSCs in fibrin could enhance neovasculature formation by increasing capillary density, in comparison to treatment by cells or fibrin separately. Concomitant to significant improvement in capillary density was an increase in the levels of VEGF in the infarct scar. CONCLUSION: This study demonstrates the angiogenic potential of the combined delivery of BM-MSCs and fibrin, and highlights the advantage of stem cell-matrix approaches for myocardial repair.